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**[Superseding IS 7825 (Part 1) : 1975**
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*भारतीय मानक*

# सिलिण्डर प्रकार का हस्त चालित लान मूवर — विशिष्टि

*( पहला पुनरीक्षण )*

*Indian Standard*

# CYLINDER TYPE HAND LAWN MOWER — SPECIFICATION

*( First Revision )*

ICS 65.060.70

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**BUREAU OF INDIAN STANDARDS**
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

*March* 2004 **Price Group 4**

Farm Implements and Machinery Sectional Committee, FAD 59

## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Farm Implements and Machinery Sectional Committee had been approved by the Food and Agriculture Division Council.

Hand lawn mowers are commonly used for cutting grass in lawns. Lawn mowers have either the cylinder (reel) type or the rotary type cutting mechanism. This standard has been prepared to guide the manufacturers to produce quality product and the users to help in selection of the lawn mower that would give the desired performance.

The cylinder type lawn mowers are generally of two types: (a) wheel type, in which the power to cylinder (reel) is transmitted through wheels; and (b) roller type, in which the power is transmitted to cylinder (reel) through rollers(s).

This standard was first published in 1975 into two parts. Part 1 covered the requirements of wheel type of cylinder type hand lawn mowers, whereas Part 2 covered requirements of roller type of cylinder type hand lawn mower. This revision has been taken up to amalgamate both the standards into single standard to make it comprehensive and user-friendly and also to update the standard.

Figures given in the standard are meant for illustration of the components.

In the preparation of this standard, assistance has been derived from:

a) D 372 B Tri-service standard for hand lawn mower, issued by Department of National Defence, Canada, and
b) 00-M-671C Hand lawn mower, issued by Federal Supply Service, USA.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# CYLINDER TYPE HAND LAWN MOWER — SPECIFICATION

## *( First Revision )*

## 1 SCOPE

This standard specifies material, constructional and other requirements for cylinder type hand lawn mower having drive wheels.

## 2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

| *IS No.* | *Title* |
|---|---|
| 210 : 1993 | Grey iron castings (*fourth revision*) |
| 399 : 1963 | Classification of commercial timbers and their zonal distribution (*revised*) |
| 617 : 1994 | Aluminium and aluminium alloy ingots and castings for general engineering purposes (*third revision*) |
| 1030 : 1998 | Carbon steel castings for general engineering purposes (*fifth revision*) |
| 1570 : 1996 | Schedules for wrought steels for general engineering purposes (*revised*) |
| 1586 : 1988 | Method for Rockwell hardness test for metallic material (Scales A-B-C-D-E-F-G-H-K) (*second revision*) |
| 1500 : 1983 | Method for Brinell hardness test for metallic materials (*second revision*) |
| 2062 : 1992 | Steel for general engineering purposes (*fourth revision*) |
| 2637 : 1991 | Steel roller chains Type S and C, attachments and chain wheels (*first revision*) |
| 3601 : 1984 | Steel tubes for mechanical and general engineering purposes (*first revision*) |
| 4432 : 1988 | Case hardening steels (*first revision*) |
| 5517 : 1993 | Steels for hardening and tempering – Specification (*second revision*) |
| 6453 : 1984 | Technical supply conditions for rolling bearings (*first revision*) |
| 7201(Part 1) : 1987 | Method of sampling for agricultural machinery and equipment : Part 1 Hand tools and hand operated / animal drawn equipment (*first revision*) |
| 9550 : 1980 | Bright bars |
| 14329 : 1995 | Malleable iron castings |

## 3 TERMINOLOGY

**3.0** For the purpose of this standard, the following definitions shall apply.

### 3.1 Hand Lawn Mower

A machine for cutting the grass on lawn and worked by manual power.

### 3.2 Cylinder Type Hand Lawn Mower

A hand lawn mower, the cutting mechanism of which consists of a fixed knife bar and a rotating cutting cylinder (reel).

**3.2.1** *Wheel Type Mower*

A cylinder type hand lawn mower in which the power for rotating cutting cylinder (reel) is transmitted through two ground wheels (*see* Fig. 1).

**3.2.2** *Roller Type Mower*

A cylinder type hand lawn mower in which the power for rotating cutting cylinder (reel) is transmitted through drive roller(s) (*see* Fig. 2 and Fig. 3).

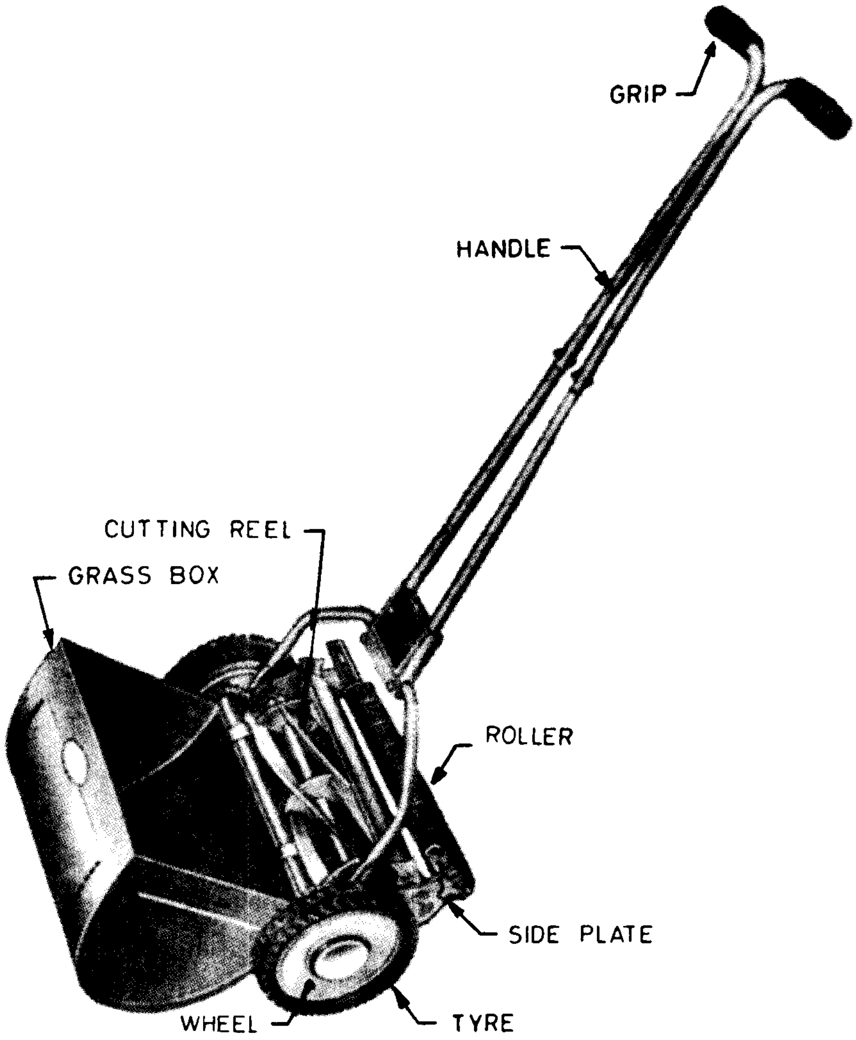

FIG. 1 CYLINDER TYPE HAND LAWN MOWER, WHEEL TYPE

### 3.3 Size

The width of cut expressed in millimetres.

## 4 CLASSIFICATION

For the purpose of this standard cylinder type hand lawn mowers shall be following types depending upon transmission system.

### 4.1 Wheel Type

*See* **3.2.1**.

### 4.2 Roller Type

Roller type cylinder lawn mowers (*see* **3.2.2**) can be of two types depending upon type of control.

#### 4.2.1 *Type A*

The mower (*see* Fig. 2) which requires one man or two men; one for controlling and other for pulling.

#### 4.2.2 *Type B*

The mower (*see* Fig. 3) which requires one man to control it and two men or animal(s) to pull it.

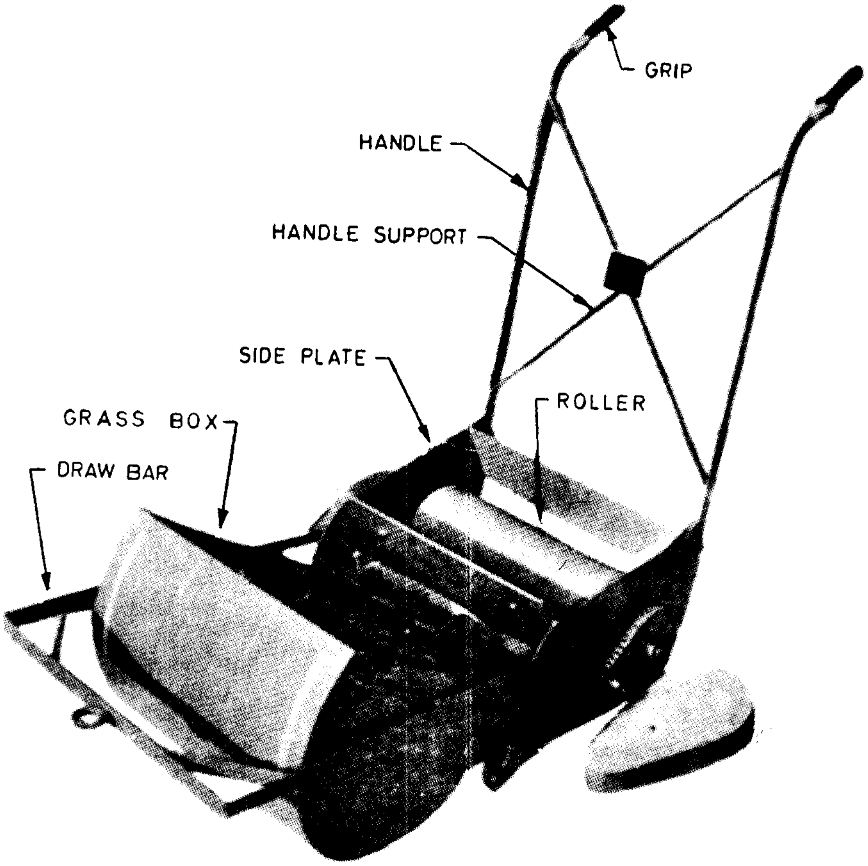

FIG. 2 TYPE 'A' LAWN MOWER

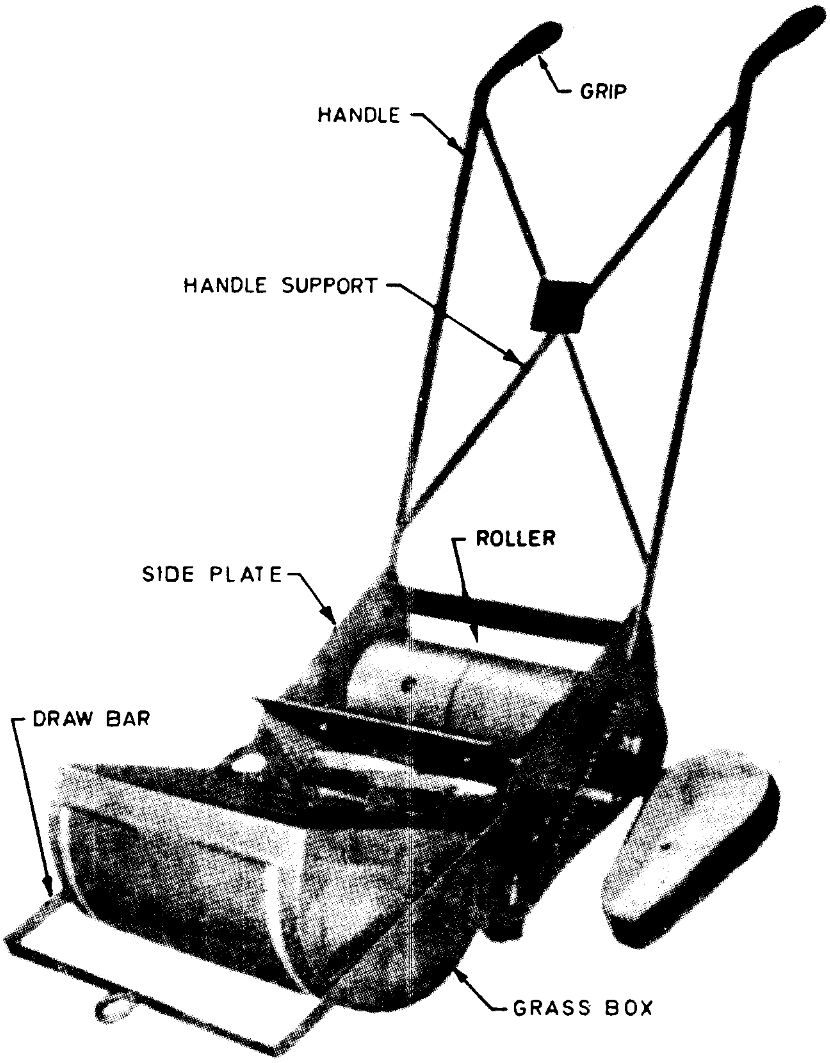

FIG. 3 TYPE 'B' LAWN MOWER

## 5 MATERIAL

**5.1** The material of construction of various components, other than blades, shall be selected from col 3 of Table 1. The material should, as far as possible, conform to relevant Indian Standards indicated in col 4 of Table 1.

**Table 1 Material of Construction**

| Sl No. | Component | Material | Applicable Standard |
|---|---|---|---|
| (1) | (2) | (3) | (4) |
| i) | Side plate | Cast iron | IS 210 |
| | | Cast aluminium | IS 617 |
| | | Mild steel | IS 2062 |
| ii) | Wheel | Cast iron | IS 210 |
| | | Mild steel | IS 2062 |
| iii) | Wheel tyre | Solid rubber | – |
| | | Semi-pneumatic rubber | – |
| iv) | Spider (collar) | Mild steel | IS 2062 |
| | | Malleable iron | IS 14329 |
| | | Cast steel | IS 1030 |
| v) | Axle | Carbon steel | IS 1570 |
| | | Mild steel | IS 2062 |
| | | Bright steel bar | IS 9550 |
| vi) | Pinion | Mild steel | IS 2062 |
| | | Malleable iron | IS 14329 |
| | | Cast iron | IS 210 |
| | | Cast steel | IS 1030 |
| | | Nylon | – |
| vii) | Bed knife bar | Mild steel | IS 2062 |
| | | Malleable iron | IS 14329 |
| | | Cast iron | IS 210 |
| viii) | Roller bracket | Aluminium alloy | IS 617 |
| ix) | Pawl | Case hardened steel | IS 4432 |
| | | Alloy steel | IS 5517 |
| | | Mild steel | IS 2062 |
| x) | Guide roller | Mild steel | IS 2062 |
| | | Hard wood | IS 399 |
| | | Solid rubber | – |
| | | Plastic | – |
| xi) | Handle | Steel tube | IS 3601 |
| xii) | Handle grip | Hard wood | IS 399 |
| | | Rubber | – |
| | | Plastic | – |
| xiii) | Tie-rod | Mild steel | IS 2062 |
| | | Bright steel bar | IS 9550 |
| xiv) | Grass box | Mild steel | IS 2062 |
| | | Canvas | – |
| xv) | Grass divertor | Mild steel | IS 2062 |
| | | Cast steel | IS 1030 |
| xvi) | Drive roller | Cast aluminium | IS 617 |
| xvii) | Gear | Mild steel | IS 2062 |
| xviii) | Bed knife bar | Cast steel | IS 1030 |
| xix) | Roller bracket | Mild steel | IS 2062 |
| xx) | Handle support | Malleable iron | IS 14329 |
| xxi) | Draw bar | Aluminium alloy | IS 617 |
| xxii) | Ratchet system | Mild steel | IS 2062 |

**5.2** The chemical composition of the steels to be used for the manufacture of blades shall be as follows:

a) Carbon, 0.50 to 0.60 percent;

b) Silicon, 1.50 to 2.00 percent;

c) Manganese, 0.50 to 1.0 percent;

d) Sulphur, 0.05 percent, *Max*; and

e) Phosphorus, 0.05 percent, *Max*.

**5.2.1** The steel of grade 55 Si2 Mn 90 (*see* IS 1570) is recommended for blades.

## 6 HARDNESS

**6.1** The rotating blade shall have a hardness of 28 to 45 HRC (*see* IS 1586) when measured within 6 mm of cutting edge.

**6.2** The fixed blade shall have a hardness of 36 to 50 HRC (*see* IS 1586) when measured within 6 mm of cutting edge.

**6.3** Pawl shall have hardness within the range of 30 to 40 HRC (*see* IS 1586). In case of case hardening, the depth of hardening shall be not less than 0.3 mm.

**6.4** All cast iron components shall have a hardness of 160 to 200 HB (*see* IS 1500).

## 7 SIZE

The lawn mowers shall be of following sizes (*see* **3.3**). The tolerance on size shall be as given against each size. The size shall be declared by the manufacturer:

a) 300 ± 3 mm,

b) 350 ± 3 mm,

c) 400 ± 5 mm,

d) 450 ± 5 mm,

e) 510 ± 8 mm,

f) 610 ± 8 mm, and

g) 915 ± 10 mm.

NOTE — Sizes given in (e), (f) and (g) shall be applicable for Type B of roller type of cylinder type hand lawn mower.

## 8 CONSTRUCTIONAL REQUIREMENTS

**8.0** The cylinder type hand lawn mowers shall conform to requirements given in **8.1** to **8.11**. However, requirements given in **8.7**, **8.8** and **8.9** shall be applicable only for wheel type lawn mowers and **8.10** and **8.11** shall be applicable only for roller type lawn mowers.

### 8.1 Side Plates

Side plates for wheel type hand lawn mower shall be designed to accommodate wheels, reel axle, bed knife assembly, roller brackets and handle and shall form a dirt and grass-proof housing. These shall also completely enclose the gear or, alternatively, these may be open type provided with suitable gear covers. Whereas, the side plate for roller type lawn mower shall be designed to accommodate drive roller, reel axle, bed knife assembly, roller brackets and transmission system. The plates shall be rigidly secured in relation to each other by means of a tie-rod or other structural member so designed as to permit easy removal of the reel assembly. The side plates may have plain, roller or ball bearings.

### 8.2 Cutting Cylinder (Reel)

It consists of minimum of 5 spiral cutting blades welded to a minimum of three spiders (collars) rigidly mounted on reel axle. The axle shall be not less than 12 mm in diameter. The axle shall be supported at side plates and shall be mounted on plain, ball or roller bearings.

**8.2.1** The diameter of the cutting reel shall be minimum 125 mm. The reel shall be ground accurately cylindrical with respect to reel shaft. A portion of at least one blade shall always be in cutting position above the knife bar.

**8.2.2** The cutting reel may be spring-mounted. Provision for adjusting height of reel in contact with bed knife blade shall be provided. Provision shall also be made for oiling bearings at each end of reel shaft.

### 8.3 Bed Knife Assembly

It consists of a horizontal knife screwed to bed knife bar. The knife shall have turned-up lip forming a cutting edge which contacts the rotating blades of cylinder (reel). Tension of bed knife against rotating blades shall be maintained by adjustment of set screws or bolts and nuts at each end of bed knife bar or by adjustment of spring mounted cutting reel.

### 8.4 Ground Roller Assembly

The mower shall have a roller of at least 38 mm in diameter and of length equal to the width of the cut. The roller shall be supported by adjustable roller brackets. The one-piece roller shall have through-shaft or steel end pins which shall be screwed or securely attached into the roller with the roller and shaft rotating as one unit. Sectional rollers shall be free to rotate on a stationary metal through-shaft.

**8.4.1** Brackets shall be secured to side plates by bolts and nuts and shall be designed so that roller may be raised or lowered to adjust cutting height from 15 to 30 mm above the ground.

### 8.5 Handle and Grip

Two handles shall be provided. The handles shall be of minimum 19 mm outside diameter pipe and shall be adequately reinforced by bracing, riveting or welding. Each handle shall be attached on side plate and shall be located at correct point of balance so that it rests at proper angle for pushing. Provision shall be made for adjusting height of the handle to suit the operator's height.

**8.5.1** Suitable grips shall be provided on handles.

### 8.6 Grass Box and Divertor

A suitably designed grass box shall be fitted on front side of cutting reel to collect the cut grass. At the rear of the reel, a grass divertor shall also be provided.

### 8.7 Drive Wheels

The lawn mower shall have two drive wheels so arranged that the cutting reel shall operate when either wheel is rotated. In case the bearings are not provided in side plates, the wheels shall have plain, ball or roller bearings. When plain bearings are used, they shall have an effective bearing length of not less than 38 mm.

**8.7.1** The outside diameter of wheel with tyre shall be not less that 190 mm. Wheels shall be securely fitted with rubber tyres. The thickness of the rubber shall be minimum 10 mm. The lugs provided on tyre shall have a depth of 8 to 10 mm. The tread shall be not less than 25 mm.

**8.7.2** Each rim of the wheel shall have suitable integrally cast or machine-cut drive gears to engage pinion gear on each end of reel shaft. Wheels may be solid or open type.

### 8.8 Pinions

The lawn mower shall be driven from both wheels with suitable ratchet action provided on both sides between the drive wheels and cutting reel. Gears and pinions shall mesh fully and smoothly. The gear ratio shall be such that the mower shall make at least 30 cuts per metre of forward travel.

### 8.9 Pawls

Pawls shall be fitted through slots in each end of reel shaft and shall be engaged with pinion.

### 8.10 Transmission System

This shall consist of one or two drive rollers and sprocket and chain or gears.

**8.10.1** The roller(s) shall be attached on axle which is mounted on side plates with the help of plain, ball or roller bearings. The diameter of the roller(s) shall be not less that 175 mm for Type A and 225 mm for Type B and length shall be equal to the size of the mower. The roller(s) shall not touch the side plates. The roller shaft shall also rotate with the roller(s). The rollers shall be provided with the ratchet system.

**8.10.2** The gears, if provided, shall properly mesh. If sprocket and chain system is provided, this should conform to IS 2637.

### 8.11 Draw Bar

A draw bar shall be provided for helping in pulling the mower.

## 9 OTHER REQUIREMENTS

**9.1** The lawn mower shall be rigid and strong in construction and side plates shall be correctly aligned when the tie-rod and bed knife are securely fastened to side plates.

**9.2** The clearance or opening in any gear housing formed by side plate and wheel shall not exceed 2 mm.

**9.3** Bearing housing shall be enclosed.

**9.4** Provision shall be made for the lubrication of bearings unless permanently grease-packed.

**9.5** The mower shall be capable of shearing at its entire length of cutting reel blade one thickness of newspaper when tested in accordance with the method given in **A-1**.

**9.6** The drive wheels and cutting reel shall be able to maintain rotation when tested in accordance with the method given in **A-2**.

**9.7** The roller bearing shall conform to IS 6453.

**9.8** The lawn mower shall withstand the mowing test as prescribed in **A-3**.

**9.9** The lawn mower shall withstand the endurance test as prescribed in **A-4**.

**9.10** Each lawn mower shall be supplied with operational manual indicating adjustments, lubrication schedule, etc.

**9.11** Each lawn mower shall also be supplied with a set of necessary tools.

NOTE — Requirement given in **9.9** shall be tested only during the type test of the mowers. For routine and acceptance test this test shall not be done.

## 10 WORKMANSHIP AND FINISH

**10.1** All castings shall be smooth and free from blow holes, pits, burrs and other visual defects that may be detrimental to their use.

**10.2** All exposed metallic parts, excluding cutting edge of the blades, shall be painted or electroplated.

**10.3** Wooden roller and hand grip, if not covered by rubber or plastics, shall be sanded smooth and varnished or lacquered.

## 11 MARKING AND PACKING

### 11.1 Marking

Each mower shall be marked with the following particulars:

a) Manufacturer's name or his registered trade-mark,

b) Size, and

c) Batch or code number.

### 11.2 BIS Certification Marking

The terracer may also be marked with the Standard Mark.

**11.2.1** The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

### 11.3 Packing

For ensuring safe handling in transit, the mower shall be dis-assembled in suitable sub-assemblies and shall be packed as agreed to between the purchaser and the supplier.

## 12 SAMPLING FOR LOT ACCEPTANCE

Unless otherwise agreed to between the purchaser and the supplier, sampling of lawn mowers for lot acceptance shall be done in accordance with **3** of IS 7201 (Part 1).

# ANNEX A

( *Clauses* 9.5, 9.6, 9.8 *and* 9.9 )

## TESTS FOR CYLINDER TYPE HAND LAWN MOWER

### A-1 SHEARING TEST

A newspaper sheet having a thickness of 0.05 to 0.10 mm shall be held against the bed knife bar approximately perpendicular to the top surface of the knife bar. The edge of the newspaper shall project approximately 25 mm above the top edge of the knife bar. The cutting reel shall be turned at normal operating speed. If any mower fails to shear the newspaper to the entire length of cutting reel, the mower does not comply with the requirement of **9.5**.

### A-2 TRACTIVE TEST

#### A-2.1 Wheel Type Lawn Mower

**A-2.1.1** The mower shall be supported or suspended 1.5 m above the floor so that the reel shaft is horizontal and there is no interference with rotation of drive wheels and cutting reel. One end of 1.75 m length of strong twine shall be fastened to the rim of the one drive wheel and wrapped around to the rim so that when the mass of 2.5 to 3.5 kg is suspended from the free end of the twine, the resulting rotation of the wheel shall also cause the cutting reel to rotate. After the mass is attached, the roller may be given an initial rotation just sufficient to begin downward descent of the mass. The mass shall descend not less than 1.25 m.

**A-2.1.2** The test given in **A-2.1.1** shall be repeated on other drive wheel.

**A-2.1.3** If the drive wheel and cutting reel do not continue to rotate until the limit of descent of the mass is reached, the mower does not comply with the requirement of **9.6**.

#### A-2.2 Roller Type Lawn Mower

**A-2.2.1** The mower shall be supported or suspended 1.5 m above the floor so that the reel shaft is horizontal and there is no interference with rotation of drive roller(s) and cutting reel. One end of 2-m length of strong twine shall be fastened to the periphery of the drive roller and wrapped around to the rim so that when the mass of 2.5 to 3.5 kg for Type A and 4 to 6 kg for Type B is suspended from the free end of the twine, the resulting rotation of the roller shall also cause the cutting reel to rotate. After the mass is attached, the roller may be given an initial rotation just sufficient to begin downward descent of the mass. The mass shall descend not less than 1.25 m.

**A-2.2.2** The test given in **A-2.2.1** shall be repeated minimum for two times.

**A-2.2.3** If the roller(s) and cutting reel do not continue to rotate until the limit of descent of the mass is reached, the mower does not comply with the requirement of **9.6**.

### A-3 MOWING TEST

The mower shall be operated on a smooth lawn free from obstructions, such as stones, heaps, etc, up to a length of 6 m for three or four rows. The cutting height shall be adjusted 15 to 30 mm above the ground. The cut shall be clean, smooth without waviness and straight to the eyes when observed from a distance of up to 6 m from the end of each strip.

### A-4 ENDURANCE TEST

The mower shall be operated at normal working conditions on a smooth lawn free from obstructions, such as stones, heaps, etc, for a period of minimum 50 h. The continuous operation shall not be less than 5 h. During and after this test no defect shall develop in the mower.

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### Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
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